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A PROCESS TO OBTAIN A THERMOPLASTIC COMPOSITION EARMARKED FOR THE MANUFACTURE OF PACKAGING PROTECTED AGAINST THE CORROSION IN FERROUS METALS DURING TRANSPORTATION OR STORAGE

[Um processo para obtenção de uma composição termoplástica destinada à confecção de embalagens protetoras contra corrosão em metais ferrosos durante transporte ou armazenagem]

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DESCRIPTIVE REPORT OF AN INVENTION PATENT

A process to obtain a thermoplastic composition earmarked for the manufacture of packaging protected against corrosion in ferrous metals during transportation or storage.

The present invention embodies a primary thermoplastic polymeric composition and a secondary thermoplastic polymeric composition, as well as their respective preparation processes, which are earmarked for the manufacture of thermoplastic polymeric packaging films acting as protectors against corrosion of ferrous parts and metal items and their alloys, usually, during transportation and storage, being subject to the most critical and diverse conditions of environmental temperature and relative humidity.

Status of the technique

The present invention embodies to the attainment of plastic packaging that acts in a way to protect ferrous metal parts against corrosion they are subject to during the entire period

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[1] Numbers in the margin indicate pagination in the foreign text.

from the time they are manufactured, transported, stored until the time they are utilized, especially if it is a long period of time, for example, it may vary from 2 to 12 months - and if the weather conditions are severe - for example, the tropical regions where the temperature and the relative humidity of the air may reach 48-50°C and 85-95%, respectively. The protection against corrosion in those metal parts becomes more critical when in a saline environment, in the case of the harbor maritime cities.

Many techniques have been known for a long time, all of them dealing with substances that protect against corrosion of metals incorporated under the most diverse shapes in the most varied types of substrata.

The US Patent 2717843 teaches us a method

to prepare materials that can inhibit the corrosion in metals in the presence of air and humidity, acting like a suspension for the covering of paper, cardboard or carton, fabrics and fibers, synthetic or not, etc., this suspension being water and/or adhesive-based containing substances such as phosphate dicyclohexylamine and sodium nitrite.

The US Patent 3433577 describes a method to protect metallic parts from the environmental corrosion which comprises the packaging of those parts in a packaging material that was treated with an inhibiting corrosion substance consisting mainly of sodium nitrite and sodium phosphate. Such composition can be applied as a solution, dispersion, paste or similar, on packaging materials, such as paper, carton, wood, fabrics, fibers and others.

The US Patent 2829080 describes heat sealed transparent sheets that contain corrosion inhibitors in a vapor stage: a transparent organic film base is pasted or laminated onto a transparent organic cover film. The duplex structure thus obtained is treated to impregnate the cover film with the inhibitor in a vapor stage by the contact of this film with a

solution or emulsion or dispersion containing the corrosion inhibitor in a vapor stage.

The US Patent 3080211 promotes additional improvements to US patent 2829080, particularly with reference to arrangement details of the aforementioned materials.

The GB patents 627801 and 919778, US 2711360, US 2739871, US 3992318, US 4130524, US 4717541, US 1528843, US 4131583, are mentioned here as known references pertaining to the state of the current techniques.

It is also important to mention the DE patents 3417149, EP 0202771, US 4290912 and US 4584175.

The German patent 3417149, claims that a transparent polyethylene sheet or a vinyl polychloride , previously treated by Corona (superficial ionization) so that one can obtain a deposition of a layer of a protection element against corrosion on the aforementioned sheet, which is employed to manufacture self-sealing bags and boxes for packaging, tube boxes, flat bags and insulated boxes.

The US Patent 4290912 assumes the manufacture of articles containing a volatile corrosion inhibitor starting from an olefin polymer, an inorganic nitrite salt, a tri-distributed phenol and hydrophobic silica.

Two examples are mentioned in the preparation of the volatile inhibitors corrosion articles by means of a plastisol formulation, which differs completely from the technique described in the present invention. A third example is mentioned using polyethylene of low density to manufacture an article similar to an extruded thermoplastic film, specifying the mentioned additives which differ from the ones utilized in the present technique, as seen in the descriptive report below. Furthermore, the US patent 4290912 states that the resulting film does not show any discoloration or gas formation, adding that it showed excellent inhibiting properties to the corrosion of sweet steel, however, not being able to explain how long the effect of the mentioned protection would last. That is, the aforementioned patent does not mention the period of time and under which weather conditions their packaging would protect metallic parts against corrosion. We also do not know whether these metallic parts are regular steel or special metallic alloys.

The US Patent 4584175 mentions a method and a composition to inhibit the corrosion of a variety of metals, besides the inclusion of shelf-life extensors for the plastic material utilized in the packaging of metallic parts.

Undoubtedly, no known plastic film has been developed up to now that can effectively inhibit the corrosion of an ample variety of metals.

As you can read in the descriptive report of the present request for an invention, the type of inhibitor concentrate does not appear to be a stable liquid gel, in accordance with the US patent 4584175. Furthermore, the present invention presents techniques that solve the known difficulties of incorporating the corrosion inhibitor to the thermoplastic polymer which will constitute the packaging film.

The EP Patent 0202771 anticipates an adequate resin composition to prevent rust to be used as a packaging material comprising a new thermoplastic resin recipe in a polymerization reactor

in which the volatile corrosion inhibitor is selected from the group consisting of amine salts from carboxylic organic acids; nitric acid, phosphoric acid and carbonic acid. Such olefin-based resin is obtained by means of a partial neutralization of a free carboxylic group in a random co-polymer of a L- olefin and a mono or dicarboxylic acid unsaturated in L, B through ethylene, in stoichiometric ratios that allow an exchange of ions after hydrolysis under an environmental high temperature and relative humidity through the passage of humidity from the outside to the inside of the packaging.

Detailed descriptive report of the invention

This invention embodies the primary thermoplastic composition to be employed in the preparation of a secondary thermoplastic composition which in turn is earmarked for the manufacture of monolithic packaging or in multiple layers to provide protection against corrosion during the transportation and storage of parts and articles made up of ferrous metals for a minimum period between 2 and 12 months.

The primary thermoplastic polymeric composition consists of a very dispersed mixture of volatile and contact corrosion

inhibitor additives, incorporated to a resin or polymeric resin mixture, utilizing appropriate incorporation equipment.

The polymeric resins utilized in this preparation technique of the primary composition can be olefin homopolymers, olefin copolymers or vinyl of the EVA, PVC, PVA type, ethylene-acid-acrylic, ethylene-acid-metacrylic, or blended with themselves or with compatible resins, in a concentration between 20.0 and 75.0% in weight.

The volatile corrosion inhibitors used comprise nitrites, benzoates, phosphates and chromates of volatile amine, utilized alone or mixed in concentrations that range between 10.0 and 70.0% in weight. The contact corrosion inhibitors involve nitrites, benzoates, phosphates, borates, sulfonates of alkaline and alkaline-terreous metals; zinc salts of the chromate, molybdenum and sulphide type, lead and calcium salts besides the organic additives of the amide type; ethoxyl amines and glycols such as glycol polyethylene. These contact inhibitor additives can be

incorporated to the polymeric resin alone, mixed among themselves or with the volatile inhibitors, in concentration areas ranging between 0.5 and 70.0% in weight.

The aforementioned amines, amides, and glycols, besides the corrosion inhibiting function, they also help in the manufacturing process of the primary composition and the secondary composition, reducing the friction and shearing level of the manufacturing process, in order to prevent thermo-mechanic degradation, mainly in the used volatile inhibitor additives, whose thermal stability is normally low.

The addition of silicon dioxide to this technique in concentrations of 2.0 to 15.0% in the primary composition is also used, for the purpose of adsorbing the volatile corrosion inhibitors during the preparation stage of the primary composition and the secondary composition. This adsorption is beneficial in the sense that it prolongs the effect of these additives, since the corresponding adsorption occurs gradually with the controlled elimination of the volatile components of the formulation. To achieve that effect, the silicon utilized must have a mean particle diameter of about 3 microns.

The utilization of silicon dioxide in these formulations is also advantageous when it is required to have a prior

micronization of some large size particle inhibitors, such as the case of the inorganic contact inhibitors. The objective of this micronization is to reduce the granulometry of these additives in order to provide a good superficial aspect to the thermoplastic film created by the secondary polymeric composition, as well as to improve its effect as contact inhibitors, since the superficial area is augmented after the micronization. In the present technique, we verified that the micronization of the contact inhibitors together with SiO_2 in levels of 2 to 15%, enables several advantages in terms of reduction of the granulometry, the ideal one being around 3 microns, besides giving "Free Flowing" characteristic to the micronized powder, which does not occur when SiO_2 is not used, because the particles of the inorganic contact inhibitors normally congregate and "harden" due to the hygroscopicity.

The utilization of the silicon dioxide and sodium nitrite was seen in the US patent 4290912, however, in very small concentrations in relation to what is intended in the

present technique. It is known that the hydrophobic silicon is applied in the "primer" resin-based alkylated formulations used as a covering to prevent the corrosion in ferrous metals.

Based upon the aforementioned ingredients, it was possible to obtain highly concentrated mixtures of those elements, processed in special equipment with temperatures as low as 80-95°C, with low levels of attrition in the incorporation, thus preventing the decomposition of some components sensitive to high temperatures, as in the case of the volatile inhibitors.

The preparation of the primary polymeric composition is normally carried out by means of a compounding equipment with a rigid control of temperature and shearing, such as the "continuous-mixers", banbury or double-thread extruders. The final physical form of this composition is granular, therefore, being very easy to manipulate and mix, when using it to prepare a secondary composition.

Preferably, the preparation technique of a primary polymeric composition must comprise equipment that enables the addition of the formulation components in stages, that is, the additives with a lower thermal stability are incorporated after those with a higher thermal stability, which preserves the characteristics of the former. That was accomplished, by

adapting mixtures with a direct feeding along the gun of a double-thread extruder, so that the more thermally unstable additives are blended only in the final stage of the incorporation process. This technique enables the addition of several high concentration additives simultaneously to the same polymeric-based resin, thus obtaining only one primary composition. As an alternative, one can prepare several primary polymeric compositions either mono or bi-additives, to be mixed together, in the subsequent stage of preparation of the secondary polymeric composition.

The secondary thermoplastic polymeric composition consists of a mixture by dilution of a primary polymeric composition (or compositions) in convenient thermoplastic polymeric resin(s). That mixture can be accomplished directly, in the equipment of the

process earmarked for the manufacture of the polymeric film by extrusion.

The synthetic polymers used in the dilution with the primary compositions are of the olefin type, and the resins may be of polyethylene with low density, copolymers of vinyl ethylene-acetate, ionic polymers or blends among them, blended in the mixture in a range of 20 to 90% in weight.

In this technique, a good compatibility between the primary compositions and the used olefin resins was observed. That compatibility was evidenced by the good characteristics of transparency, coloration, superficial aspect, welding and characteristics of the impression of the extruded films, besides the effectiveness in inhibiting corrosion.

We have also verified that the compatibility between the primary polymeric compositions and the synthetic polymers used in the dilution is optimized in the following situations:

- When one dilutes a primary polymeric composition containing volatile and contact inhibitors in vinyl ethylene-acetate copolymer resin with a high distribution of molecular weight, high content of vinyl acetate (19%) and medium MFI (6 g/10 min. ASTM D 1238-E), this mixture being augmented with primary polymeric compositions containing additional processing

and anti-blocking additives; it is possible to manufacture films in low processing temperatures (<100°C), in conventional extruders, with an optimum incorporation of additives and without a decomposition of the additives more sensitive to the temperature. Besides, the EVA film obtained does not show any problems of a high friction or blocking ratio, being utilized in conventional equipment of cutting and soldering.

- When one dilutes a primary polymeric composition containing volatile and contact inhibitors in an ionic copolymer, that mixture is then augmented with primary polymeric compositions containing additional processing and anti-blocking additives, it is possible to manufacture films in temperatures of up to 125°C in conventional extruders, with an optimum incorporation of the additives, without any decomposition. In this case, the optimum compatibility between these ingredients, mentioned in the EP patent 0202771 is improved. The same

results are obtained by using blends of LDPE (low density polyethylene) with the ionometer:

- In resins with processing temperature exceeding 125°C, when it becomes difficult to prevent the decomposition of the volatile additives even when adding additional processes, the compatibility was accomplished by adapting a small blend-extruder at the end of the gun, near the primary/extrusion head of the film. In this case, one works on the main extruder with the high temperature processing resin (LDPE, for example) and in the connected extruder, one works in low temperatures only with the primary compositions, which mix with the high temperature processing resin only in the final extrusion stage, and the decomposition does not occur due to the short-time of residence. The good homogenization of the primary composition with the dilution resin in the extrusion, can be accomplished, by adapting a static mixer of low shearing (SULZER-MR TYPE) at the end of the thread in the main extruder. The scheme of this technique is illustrated in figure 1.

The compositions obtained by the aforementioned described techniques showed remarkable results regarding the effectiveness in inhibiting the corrosion of ferrous and some non-ferrous metals.

Through deep analytical studies and experimental observations, we discovered that when a metal is involved in a manufactured packaging in accordance with this technique, the following phenomena of anti-corrosive protection simultaneously occur:

1. The glycols, amines and amides contained in the formulation migrate to the film surface due to their partial incompatibility with the polymeric resin. On the other hand, the films manufactured with the polymeric resins mentioned in this patent show a certain permeability to water vapors and other corrosive gases, allowing these atmospheric components to pass to the inside of the packaging. Similarly to the corrosion inhibitor additives, both the contact and volatile ones, are soluble in water and partially soluble in glycols, amides and amines, we noticed that this entire group undergoes a migration process to the film surface that surrounds the metallic part. Consequently, all the humidity present in the inside portion of the packaging starts having

dissolved corrosion inhibitor agents, therefore, not causing any corrosion in the packaged article.

2. The polymeric resins involved in this patent cannot retain in its structure the aforementioned volatile resins, due to the very low vapor pressure shown by these components. Thus, there is a saturation on the inside of the packaging environment with these volatile products, reaching all the metallic surfaces, even if there is no direct contact between them and the film.

The volatization ratio of these additives varies in terms of their concentration when incorporated to the resin, and can be controlled by the above-mentioned adsorption/desorption, by utilizing SiO_2. Furthermore, the incorporation resin influences directly the volatization ratio in terms of the compatibility or not of same with the incorporated volatile additive. Thus, resins compatible with the volatile additives, such as for example, the ionic olefin copolymers, allow a slower and more gradual volatization, providing a more prolonged anti-corrosive effect. We can dispense with the utilization of SiO_2 in this case, unless used as an anti-blocking agent. On the other hand, resins of low compatibility with the volatile additives, allow a

more rapid volatization of same, however, it is necessary to delay the process by using SiO_2 for example.

3. The inorganic contact inhibitors, even though they do not migrate to the film surface, they also act in an effective manner by means of a partial solubility in water vapors permeated by the packaging, canceling their corrosive effect. Besides, since they are micronized with a small-sized particle, they come up to the surface on the polymeric film, passivating the metallic part which is in direct contact with the surface of this film containing the additive.

4. When coextruded packaging containing resin layers more impermeable to water vapors and oxygen are manufactured, the anti-corrosive effect can be even better, because it simultaneously combines the anti-corrosive additives with the low permeability to corrosive agents.

EXAMPLES

Example 1

An "A" primary thermoplastic polymeric composition can be obtained utilizing an ethylene vinyl acetate (EVA) with a flow level (ASTM D 1238-E) = 30 g / 10 min and vinyl acetate content = 19%, by incorporating a volatile corrosion inhibitor additive of the dicyclohexylamine (DICHAN) nitrite type and a processing contact/additional corrosion inhibitor of the oleamide type, in the following percentages:

EVA: 59.5%

DICHAN: 40.0%

Oleamide: 0.5%

The incorporation process was carried out utilizing a compounding equipment of the "continuous mixer" type, in the following conditions:

Chamber temperature: 100°C

Rpm of the rotors: 20

Extruder temperature: 100°C

Rpm of the extrusion thread: 100 maximum

All the ingredients were added together in the equipment feeding funnel, thus obtaining a final homogeneous composition and in the granular form. Instrumental analysis techniques showed a maximum loss of 2% in the incorporated additives, which reflects the good incorporation capacity of this technique. The

mass temperature after leaving the extruder was also measured and it was verified that it did not exceed 100°C, which confirms the additional effect of the oleamide process utilized, preventing the thermo-mechanic degradation of the volatile additive.

Example 2

A "B" primary thermoplastic polymeric composition can be obtained utilizing an ethylene vinyl acetate copolymer with MFI 30 g / 10 min and vinyl acetate content = 19%, by incorporating a contact corrosion inhibitor additive of the sodium nitrite type previously micronized with 5% of SiO_2 and an additional processing of the calcium stearate type, in the following percentages:

EVA: 58%

Sodium nitrite with 5%SiO_2 micronized: 40%

Calcium stearate: 2%

A high revolution intensive compounding equipment was used, where the incorporation is accomplished through a high shearing, fusing the mixture by the generated

heat. In this case the temperature control is not essential, since the ingredients of this composition have a high thermal resistance. The incorporation time was 10 seconds, and a homogeneous and very dispersed mass was obtained, subsequently ground, extruded and granulated in conventional equipment.

These same steps can be followed to obtain primary thermoplastic polymeric compositions containing other additives with high stability to the temperature, in accordance with the "C" formulation shown below:

EVA: 60%

SiO_2 : 25%

Oleamide: 15%

Example 3

A "D" primary thermoplastic polymeric composition can be obtained utilizing an ethylene vinyl acetate copolymer with MFI 30 g / 10 min and vinyl acetate content = 19%, by incorporating a volatile corrosion inhibitor additive of the dicyclohexylamine nitrite type, contact inhibitor of the inorganic type, such as sodium nitrite, organic contact inhibitor of the oleamide type, which also shows an additional processing function, and SiO_2 adsorption, in the following percentages:

EVA: 39.5%

Dicyclohexylamine nitrite: 30%

Sodium nitrite with 5% SiO_2 micronized: 20%

Oleamide: 0.5%

SiO_2 : 10%

The incorporation process was accomplished utilizing a compounding equipment of the double thread type with two independent feeding funnels situated along the gun, one of them in the thread feeding area (main funnel) and the other one immediately before the area where the thread is located (secondary funnel). In this case, the incorporation sequence of the additives was done by observing their decomposition temperature, that is, the dicyclohexylamine nitrite was mixed alone in the secondary funnel, while the other components were blended altogether in the main funnel. A granular and homogeneous primary thermoplastic polymeric composition was obtained, with a loss in the volatile additive of less than 2%.

Example 4

An "E" secondary thermoplastic polymeric composition can be obtained by diluting some primary thermoplastic polymeric compositions in an ethylene vinyl acetate resin with MFI = 6.0 g / 10 min and vinyl acetate content = 16%, in accordance with the formulation:

EVA MFI 6.0: 85%

"A" composition: 5%

"B" composition: 5%

"C" composition: 5%

This "E" composition was processed in a conventional extrusion equipment with a simple thread, manufacturing films of 150 microns thick in the shape of bobbins. The processing conditions were as follows:

Temperature: 80 - 95°C

Rpm of the thread: 32

mesh: one 40 mesh

The film obtained showed good characteristics of transparency, slight yellow coloration, flat superficial aspect, good soldering, it allows the impression by conventional processes, it is exempt from blocking problems and shows a low friction ratio. Packaging manufactured with these films proved

to be effective in inhibiting corrosion in 1010 steel plates in adverse natural environmental conditions for a period that exceeded 150 days (temperature ranging between 20 and 40°C, relative humidity 90%.)

Example 5

An "F" secondary thermoplastic polymeric composition can be obtained by diluting some primary thermoplastic polymeric compositions in a blend of 70% of ionic polymer, with 30% of low density polyethylene. An ionometer provided by Dupont, sodium ion-based, was utilized with MFI = 1.0 g / 10 min and LDPE provided by Triunfo Petrochemical, with MFI = 6 g / 10 min.

Ionometer/LDPE blend: 90%

"A" composition: 5%

"B" composition: 1%

"C" composition: 4%

This "F" composition was processed in a conventional extrusion equipment with a simple thread, and films of 150 microns thick were manufactured as

bobbins. The processing conditions were as follows:

Temperature: 115 - 120°C

Rpm of the thread: 30

mesh: one 40 mesh

The film obtained showed excellent characteristics of transparency, yellow coloration almost unnoticeable, flat superficial aspect, good soldering, it allows the impression by conventional processes, it is exempt from blocking problems and shows a low friction ratio. Packaging manufactured with these films proved to be effective in inhibiting corrosion in 1010 steel plates in adverse natural environmental conditions for a period that exceeded 200 days (temperature ranging between 20 and 40°C, relative humidity 90%.)

Example 6

A "G" secondary thermoplastic polymeric composition can be obtained by diluting some primary thermoplastic polymeric compositions in low density polyethylene with MFI = 6.0 g / 10 min., in accordance with the formulation:

LDPE: 93%

"D" composition: 93%

The incorporation process was executed utilizing the specific transformation equipment illustrated in figure 1. The main extruder worked with the LDPE in a temperature of 140°C, with 50 rpm, while the extruder adapted to the gun near the head, worked only with the "D" composition at 95°C, with 20 rpm. The final thickness of the film was 150 microns.

The film obtained showed characteristics comparable to those obtained in the previous examples, being effective in inhibiting corrosion in 1010 steel plates in adverse natural environmental conditions for a period that exceeded 120 days (temperature ranging between 20 and 40°C, relative humidity 90%.)

Example 7

A multi-layered thermoplastic film can be obtained by the hot rolling of the film generated by the "H" secondary thermoplastic composition together with an isotropic textured ion obtained by the hot junction and drawing of at least four layers of a film obtained by extrusion diagonally cut

in a tubular matrix. The resulting film showed a weight in grams per square meter of 144 g / m2, with a final thickness around 90 microns.

"H" composition: EVA: 64%

"A" composition: 18%

"B" composition: 18%

The extruded film from the "H" composition represents approximately 30% of the multi-layered structure in example 7, so that, when being used, it will have that layer turned to the inner side of the intended packaging and, therefore, in contact with the metallic surface to be protected against corrosion.

Noticeable characteristics of this multi-layered structure are their mechanic properties (durability, puncturing and tearing resistance, already known) added to the advantage that during the manipulation of the films containing additives with the type of toxicity of the DICHAN and the sodium nitrite, the outer layer will work as their impermeability reinforcement.

The effectiveness in inhibiting the corrosion of 1000 steel plates in adverse natural environmental conditions exceeded 200 days (temperature ranging between 20 and 40°C, relative humidity 90%.)

Example 8

A multi-layered thermoplastic film can be obtained by a low density polyethylene coextrusion together with the "I" or "J" composition such as:

"I" composition:	Blend of LDPE / ionometer: 79%
	"D" composition: 21%
"J" composition:	EVA: 55%
	"A" composition: 15%
	"B" composition: 15%
	"C" composition: 15%

The final structure of a 150 micron film, in both cases, was about 100 microns of LDPE and 50 microns of the "I" or the "J" composition. The extruder carrying LDPE operated at a mass temperature of approximately 140°C and the second extruder carrying the "I" composition operated at a temperature of up to 123°C (when the "J" composition was used, the temperature reached 100°C). The junction point of these layers, that is, the extrusion matrix reached a maximum 110°C, with the

additive layer situated internally in relation to the packaging film. The advantages of this type of coextruded structure are to increase the barrier or to diminish the loss of volatile corrosion agents towards the exterior of the packaging, besides providing good characteristics of hot sealing and reasonable transparency of contact.

Such packaging showed a protection against corrosion in the 1010 steel in adverse natural environmental conditions for a period of time exceeding 180 days (temperature ranging between 20 and 40°C, relative humidity 90%.)

CLAIMS

1. A primary thermoplastic composition to be employed in the preparation of a secondary thermoplastic composition earmarked for the manufacture of monolithic or multi-layered packaging providing protection against corrosion during transportation and storage of ferrous metals and their alloys, characterized by containing copolymers of the olefin type, blended or not, in a range of 20 to 75% in weight, corrosion inhibitor volatile agents in a concentration between 10% and 70% in weight, contact corrosion inhibitor agents in a concentration between 0.5 and 70% in weight, amides as additional processing agents in a concentration between 0.5 and 15% in weight and silicon dioxide as an adsorption and desorption of corrosion volatile inhibitors in a concentration between 2.0 and 15% in weight, and the aforementioned components (volatile inhibitor agents, contact inhibitor agents, amides and silicon dioxide) can be mixed together in the same primary composition or separately in separate primary compositions.

2. A primary thermoplastic composition, in accordance with Claim 1, characterized by containing olefin copolymers such as

ethylene vinyl acetate in a concentration of 50 to 60% in weight.

3. A primary thermoplastic composition, in accordance with Claim 1, characterized by containing sodium or zinc salts ionic copolymers in a concentration between 10% and 50% in weight, in case the primary thermoplastic composition is a blend.

4. A primary thermoplastic composition preparation process, obtained in Claim 1, characterized by the prior micronization stage of the inorganic contact inhibitors together with the silicon dioxide and a particle size of up to 3 microns, aiming at providing a "free flowing" characteristic

to the resulting powder, as well as augmenting the superficial area after the micronization, consequently favoring the quality of the thermoplastic film created by the primary thermoplastic composition and resulting from the secondary thermoplastic composition.

5. A primary thermoplastic composition preparation process, in accordance with Claim 4, characterized by the rigid control of the temperature and the rotation of the processing equipment employed, as well as following the addition in stages of the components of the formulation, so that the additives of lower thermal stability are incorporated after those of higher thermal stability, which preserves the characteristics of the former, in the event that it contains all the formulation components.

6. A secondary thermoplastic composition earmarked for the manufacture of packaging films, characterized by containing from 5 to 20% in weight of each primary thermoplastic composition, obtained in Claim 1 and from 80 to 95% of ethylene vinyl acetate polymer, low density polyethylene or a blend of low density polyethylene with ionic copolymers.

7. A secondary thermoplastic composition preparation process, obtained in Claim 6, characterized by assuming a small blend/extruder at the end of the gun, near the primary/extrusion

head of the packaging film, so that polymers can be used whose processing temperatures are above 125° in the main extruder and the primary compositions in the lateral extruder with the objective of processing them in temperatures below 100°C. Those primary compositions should only mix with the resident polymer in the main extruder only in its last extrusion stage, so that it will minimize or prevent the thermal decomposition of the volatile ingredients due to the low residence time under heat and the shearing provided to the mass residing in the small blend/extruder.

8. A multi-layered thermoplastic film in accordance with example 7, characterized by containing approximately 30% of the "H" secondary thermoplastic composition on its inner side, which contacts the metallic surface of the part to be protected against corrosion and 70% resistant and impermeable material to

the existing volatile ones, in the outer layer.

9. Multi-layered thermoplastic film, in accordance with example 8, characterized by containing approximately 30% of the "I" or "J" secondary thermoplastic composition on its inner side and about 70% of LDPE on its outer side, with good characteristics of hot sealing and better impermeability to volatiles than the films obtained from the monolithic secondary thermoplastic compositions characterized in Claim 6.

SUMMARY

Invention patent. A process to obtain a thermoplastic composition earmarked for the manufacture of packaging protected against corrosion in ferrous metals during transportation or storage."

The present invention patent refers more precisely to a primary thermoplastic polymeric composition and a secondary thermoplastic polymeric composition earmarked for the manufacture of packaging films to protect ferrous metals and their alloys against corrosion during transportation and storage and their processes of preparation, whose primary composition contains olefin copolymers blended or not (20 - 75% in weight), corrosion volatile inhibitors (10 - 70% in weight), contact corrosion inhibitors (0.5 - 70% in weight), amides (05 - 15% in weight) and silicon dioxide (2.0 - 15% in weight), whose secondary composition contains from 5 to 20% in weight of the primary composition and from 80 to 95% in weight of olefin, vinyl or ionic copolymers, either alone or blended among themselves, whose preparation processes include a rigorous control of temperature and a rotation of mixture equipment, in accordance with Claims 5 and 7, resulting in the manufacture of monolithic or multi-layered films, in accordance with Claims 6,

8 and 9, which are earmarked to package ferrous metals parts during transportation and storage for periods comprising 2 to 12 months under critical temperatures and environmental relative humidity conditions, protecting them against corrosion.